

# The role of CORFO in Chile's Development: Achievements and Challenges

*Stephany Griffith-Jones, María Luz Martínez Sola and Javiera Petersen<sup>1</sup>*

## I. Introduction

CORFO (Corporación de Fomento de la Producción or Production Development Corporation) was created in 1939. In the initial period, it was an overarching and powerful institution that participated in the funding of over 30% of Chilean investment in equipment and machinery and 25% of public investment (Durán and Fernandois, 2011). Through many instruments, it played a key role in the process of Chilean economic development, including the creation of many crucial enterprises that it also helped to run.

In later years, its relative scale diminished significantly, both in terms of the part it plays in promoting development, and the share that its operations have in relation to total credit to the private sector. In 2015, the financial support deployed by CORFO (through grants, credits and guarantees, see Table I) amounted to USD 2,863 million, which represents only 1% of Chile's GDP. As discussed below, guarantees granted by CORFO now play a much larger role than loans made by CORFO to banks, which on-lend to the private sector. It is noteworthy that CORFO's credit to the private sector is

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<sup>1</sup> We thank BNDES and CAF for their financial and intellectual support; we are especially grateful to Lavinia Barros de Castro, Vinicius Carrasco and Pablo Sanguinetti, for their valuable comments on the initial draft, and Lavinia for her valuable comments on the second draft. We are very grateful to all colleagues interviewed, who gave their valuable time and knowledge; these included the current Executive Vice President of CORFO, Eduardo Bitran, and two former Vice Presidents, Carlos Alvarez and Gonzalo Rivas; a full list of people interviewed and who provided information is provided at the end of the paper.

not just relatively far smaller than it was in earlier periods in Chile, but is also significantly smaller in scale, compared to the size of the Chilean economy (as proportion of GDP) and to total domestic credit to the private sector, than national development banks in other countries, such as KfW in Germany, with a ratio of loan portfolio to GDP of 14.5% and to domestic private sector loans of 15.2 %; BNDES in Brazil with 11.7% and 16.6% respectively or CDB in China with 12.2% and 9% respectively.

An important question to ask is whether the relatively small scale of resources that CORFO provides at present is sufficient at a time when Chile urgently needs to undertake a major structural transformation of its economy, for ‘smart’ and higher productivity diversification, so as to achieve more dynamic, inclusive and sustainable growth. The urgency of the challenge is clearer at a time when the sharp fall in the copper price in recent years has contributed to a major slowdown of Chile’s economic growth, which shows the vulnerability of a model based on exports, mainly of primary commodities. There are more long-term structural challenges for future growth based on natural resources, which also make structural transformation urgent. These are linked to the physical and environmental limits for further natural resource development in Chile; they relate for example to scarcity of water (to produce one glass of wine requires an input of 100 liters of water!), limits of land available to expand forestry, for wood, as well as paper and cellulose, and resource limits to the production of salmon. Furthermore, very slow productivity growth in Chile makes it crucial to accelerate investment aimed at enhancing productivity growth and thus increase the competitiveness of the Chilean economy.

While the fairly deep Chilean banking and capital markets may have been relatively efficient in financing established enterprises and sectors at a relatively low cost, they may not be able or willing to take on the risk of financing the new enterprises in new sectors that the current and future circumstances of Chile demand, especially at sufficient maturities. Thus, funding ‘*mission-oriented investments*’ (Mazzucato & Penna, 2015) that could catalyze transformational impacts in the economy is essential and requires the action of public financial institutions, such as CORFO, capable of channeling sufficient resources to strategic sectors with large positive externalities, such as renewable energy (see below). Such channeling of public resources would help raise additional private resources, which would co-finance such investments. Thinking of the new industrial revolution worldwide, Chile needs more and better investment in high-speed connectivity, such as a network of fiber optic; it also requires the digitalization of agriculture to improve productivity. It may require large and lumpy finance for major projects that are socially profitable: an example is a potential major investment in Chile’s smelting copper capacity, which could help the country move up the value chain in copper exports. Often such activities are not profitable in the short term, as they involve major economic or environmental externalities; also large-scale investment, even if profitable in the long term, may be difficult to fund purely with private finance.

An institution like CORFO could help provide and catalyze funding necessary for such initiatives. In this sense, it seems important to both expand the scale of CORFO and make sure that the instruments it uses are appropriate for the current stage of Chilean development.

Fiscal resources are currently fairly constrained, and perceived to be constrained in Chile, (like in many other Latin American countries), as growth has slowed down, and tighter fiscal policies have been adopted. At the same time, there has been greater emphasis in Chile on prioritizing the use of the limited fiscal resources to meet social needs (especially in education), with long-term development benefits. This, however, limits the scale of CORFO, which currently relies mainly on fiscal resources for funding, as there are (or are perceived to be), relatively less fiscal resources available to finance structural transformation, such as support for R&D, financing innovation in new companies and new sectors.

R&D is particularly key for natural resource-based economies, which reportedly need to invest more in relation to GDP than other economies to be successful; furthermore, R&D spending is fairly low in Chile, so support by institutions like CORFO, in collaboration with other public and private institutions, is very relevant.

It would therefore seem desirable to use CORFO to help fund and catalyze further private funding towards such key activities. Given Chile's deep domestic capital markets, favorable access to international capital markets, as well as the fact it has investment grade credit rating, an interesting funding alternative for CORFO would be getting authorization from the Finance Ministry to raise funds on the local capital markets. This is the most regular source of funding for many other national development banks, such as KfW in Germany, the Business Development Corporation (BDC) in Canada and others. Indeed, according to Martinez Luna and Vicente (2012), 89% of national development banks borrow from other financial

institutions or issue debt on local capital markets; it would therefore seem appropriate for CORFO to do so as well.

This would mean public resources could be significantly leveraged, as the enlarged activities would be financed from the private capital market, and any public contribution would be related to relatively small increases of CORFO's capital, to comply with Basel capital requirements; the latter would be the only part which would go into calculations of the fiscal deficit, as is the case, reportedly, for KfW, for example. Therefore, there would be very limited impact on the fiscal deficit, and CORFO could benefit from a potentially very large expansion, with resources raised on the capital markets to increase its credits and guarantees.

Reportedly, in the late 2000s, the then Vice-president of CORFO had suggested that CORFO could issue bonds for USD 500 million to fund new credit lines for SMEs (interview material). However, the Finance Ministry preferred to increase the fiscal contribution to CORFO. As the precedent for such a proposal exists, and CORFO is authorized to raise funding in this way once the Finance Ministry approves it, this should make it easy for CORFO to raise funds on capital markets.

Besides raising funds in national and international capital markets, CORFO could further increase its scale through additional funding from other development banks. It already successfully taps institutions like CAF, Inter-American Development bank and KfW, and could do more; this could be further expanded to include institutions like the Chinese Development Bank, especially given the strong trade and investment links that Chile has with China, and the European Investment Bank.

As detailed below, CORFO has been innovative in deploying a number of activities (such as supporting entrepreneurship through innovative programs like *Start-Up Chile*), and supporting a variety of sectors. However, within the range of instruments it has used, it has given a decreasing role to credit, and an increased role to grants and, especially, guarantees. Though this may be a fairly common trend in some Latin American development banks (e.g. NAFINSA in Mexico), it is different from the instruments used by highly successful banks like German KfW, which continue to use credits, mainly channeled through financial intermediaries, as a major instrument, especially for new sectors (such as renewable energy) and for SMEs; this is the case even though German capital and banking markets are more developed than their Chilean counterparts.

Helping promote Chilean exports in new sectors, as well as helping Chilean companies invest abroad, is another key challenge that CORFO should address more to boost Chile's long-term international competitiveness (going beyond sectors where Chilean firms have already successfully expanded abroad, such as retail and paper). This is an important new function of public development banks, carried out by institutions like the Chinese Development Bank and BNDES.

Particularly in this new phase of Chilean development, which urgently requires economic diversification into new sectors, but faces initial risks and uncertainty that may be far higher than in the past, it seems crucial that CORFO swiftly deploys a full battery of instruments. These should include credits especially, to support more innovative enterprises and sectors that generate a high proportion of employment in the Chilean economy - as well as SMEs more generally -, especially for loans of

longer maturities, which private banks are less likely to grant. This will allow these companies to obtain enough credit, at sufficiently long maturities and at reasonable cost. Naturally, such an expansion of credit should be combined with the continued use of currently deployed instruments, such as guarantees, grants and contributions to risk capital. The above-mentioned expansion of the scale of CORFO's resources would thus facilitate not just an increase in the level of activity of the institution, but allow the deployment of a more complete mix of instruments required to finance private enterprises and support structural diversification.

In what follows, we first briefly analyze the history of CORFO, linking it to the needs of Chile's development model. Then, we outline the objectives that CORFO is pursuing. Later, we describe the main features of CORFO today, as well as emphasizing its counter-cyclical role. Then, we explain and analyze the main programs and activities that CORFO pursues currently. This is not easy, as CORFO has developed a large number of instruments and activities; as we argue below, there may be a case for streamlining some of these instruments, making access to them simpler to users, as well as possibly putting greater focus on fewer priority sectors. We then examine in some detail the role of CORFO in the development of solar energy in Chile, and in launching *Start-Up Chile*. Finally, we conclude and draw policy implications.

## II. Brief history of CORFO

Since 1939, CORFO, seen overall by governments of different persuasions as an efficient instrument to serve their development objectives and strategies, has played very varied roles (Muñoz Goma, 2009).

Its launch in 1939 made CORFO one of the first national development banks in Latin America, after México's Nafin, established in 1934. At the time, the needs of import substitution industrialization (ISI), blended with the catastrophic consequences of the 1939 Chillán earthquake, set the stage for CORFO's creation. In the initial period, it was a large and influential institution that participated in the funding of over 30% of investments in equipment and machinery and 18% of gross capital formation. (Durán and Fernandois, op.cit). Furthermore, CORFO created and played an important role in many of the key public enterprises central to Chile's development. In the initial years, these included the enterprise for electricity distribution (ENDESA), steel (CAP), sugar beet processing (IANSAs), oil (ENAP) and national airline (LAN). In the 1960s, it continued creating key enterprises, in sectors like telecommunications (ENTEL) and public TV (TVN) (Rivas, 2012). CORFO also supported the transition to a more export-oriented model, for example by providing financial backing to the forestry sector, which helped develop the paper and cellulose industry (personal experience).

During the Popular Unity government, CORFO played an important role in nationalizing enterprises, whereas under the military government, it did the reverse and was involved in the privatization-of many companies. Also under the military government, CORFO was forbidden from owning or creating state enterprises; it is interesting that other national development banks, like KfW, still own shares in public



enterprises today. During the 1982/3 debt and banking crisis (which hit the Chilean economy especially hard), as well as more recently during the 2008/9 financial crisis, CORFO played an important counter-cyclical role by significantly increasing its credit to private enterprises and guarantees for such credit to banks.

When democracy returned, CORFO was in a very weak financial position, with USD 1.6 billion of liabilities linked to the privatization process and over USD 700 million of impaired loans. Some voices then raised the possibility of dissolving CORFO, but the view prevailed that the institution ~~CORFO~~ should continue to play a key role in supporting private investment to achieve productive development. CORFO managed to improve its financial position, and focus on its new tasks. Furthermore, its credibility was enhanced both by a series of independent evaluations of impact, as well as the Ministry of Economy setting clear guidelines for CORFO and identifying challenges (Rivas, 2012).

Following suggestions made by the World Bank, CORFO switched from giving credit directly to becoming a second-tier institution providing credit and, increasingly, guarantees through financial intermediaries. The shift towards reducing the role of credit, while increasing the role of guarantees and targeted grants, accelerated since the Pinera Government came in.

Currently, CORFO implements long-term strategic goals determined by the National Council for Innovation and Competitiveness (CNIC), which advises the executive and legislative branches of government (Ministry of Economy, 2015). Several Ministers



sit on the Board of CORFO. Thus CORFO is closely linked to the development aims of the government, while having a close dialogue with the private sector.

### III. Development Strategy in Chile and the role of CORFO

The legacy of privatization during the military regime and of unpaid debts to the institution relegated CORFO mostly to tasks related to financial management in the early 1990s. The difficult financial situation that CORFO inherited required efforts directed towards a solution. Thus, for a time, CORFO's historical role was pushed into the background of its activities.

With the return of democracy, a debate started on the appropriateness of keeping CORFO. Within the political and academic sphere, questioning the very idea of economic intervention through industrial policies had become quite widespread. However, the prevailing stance suggested that even within a market economy, there are important market imperfections and failures, which can undermine productivity and overall growth. These market failures and imperfections, as well as some (then weak) concerns about the need for a structural diversification of the Chilean economy, justified policy interventions, looking to correct market imperfections.

The most decisive step towards official confirmation that a policy agenda for productive development was needed was the design of new CORFO instruments, as well as evaluations to assess their impact, especially important to justifying them to the Finance Ministry.

Subsequently, with the creation of The National Council of Innovation and Competitiveness, more ambitious progress was achieved in terms of the need to direct efforts at the sectorial level. A study by the *Boston Consulting Group* proposed eleven

sectors as priority: aquaculture, functional foods, fruit farming, mining, pig and poultry farming, global services, special interest tourism, logistics and transportation, wideband and financial services. A committee of ministers chose five clusters, to propose a policy design that would boost each industry.

In recent times, CORFO and the Ministry of Economy has launched the Strategic Program of Smart Specialization (SPSS), *Transform Program: ‘The Transform Program aims to improve the competitiveness of our economy through the development of eleven strategic sectors’*. This phrase commits to the implementation of productive development policies. Chile had already embarked on this path with the proposal made earlier by The National Council of Innovation and Competitiveness.

*‘Chile needs to change its productive structure – with the production and export of goods based not only on natural resources – and advance towards a more sophisticated, specialized, diverse and innovative economy, which will enable it to create a new national productive baseline’*. Productive sectors chosen for the SPSS are high-grade mining, tourism, health foods, building industry, fishing and aquaculture, solar industry, logistics for exports, smart industries, creative economy, advanced manufacture and technologies and health Services.

In 2014, the Productivity, Innovation and Growth Agenda was launched, which aims to overcome obstacles preventing the increase of economic productivity. A Fund for Strategic Investments (FSI) was created to finance initiatives aimed at improving productivity and productive diversification. Among the funded projects are the SPSS from the Transform Program (Comisión Nacional de Productividad, 2014).

Priority sectors for the FSI are fishing and sustainable aquaculture, sustainable tourism, solar Industry, logistics, sustainable building Industry, advanced manufacturing, smart industry, creative industry, services and health technologies, high-grade mining and healthy food.

The previous paragraphs show clearly which sectors Chile is looking to promote; the Chilean productive development strategy is thus set. However, different government entities play a role in the productive transformation of the country, often with their own policy agenda, and there is not full coordination between them, nor with the private sector. It is important for them to coordinate better, and develop and implement a productive development approach in a strategic way at institutional level.

#### **IV. CORFO and its institutional relationship with the government**

CORFO is attached to the Ministry of Economy, and is led by a governing board chaired by the Minister. The Vice-President of the Board and the Executive Vice-President of CORFO are appointed by the President of the Republic. Moreover, this Board includes the Ministers of Foreign Affairs, Finance, Social Development and Agriculture.

Until 2006, the relationship between CORFO and the government was focused on the composition of its board and the reach of its instruments and programs, involving the participation of other ministries. The creation of the National Innovation and Competitiveness Council established a new institutional design to support the proposed national strategy (Rivas, 2012). Within this strategy, CORFO has a defined role, and it is therefore possible to identify its relations with other government institutions more clearly.

The objective of the National Council of Innovation and Competitiveness, apart from setting long-term strategic guidelines for the policy, is to propose ideas for the use of the Innovation and Competitiveness Fund (ICF), funded by income from the royalties paid by the mining sector. ICF works as a financial implementation entity for CORFO and CONICYT; the latter, as a branch of the Ministry of Education, specializes in tasks related to science, technology and production of human capital.

There is also the Committee of Ministers for Innovation, whose executive secretariat is headed by the Ministry of Economy. The Innovation Department of the Ministry of Economy is in charge of coordinating several public entities related to the programs defined by the Innovation Policy and Strategy.

In addition to the innovation strategy, there is the Productivity Agenda for Innovation and Growth, which has a shorter and medium-term scope of action. CORFO and the Agenda are related through the Strategic Inversion Fund, which finances CORFO programs that are aligned with the objectives proposed for the Agenda.

Even so, CORFO is committed to policies and instruments that go beyond the national system of innovation. A big percentage of their programs are own-initiatives funded mainly by the allocated public budget.

The national system of innovation establishes networks that only respond to one part of the productive development policy of the country. The institutional organization needs to be expanded to all the spheres of action of public policies working on productive transformation, search for innovation and promotion of competitiveness, with the aim of coordinating all efforts and available resources efficiently to maximize the impact on the economy.

## **V. CORFO today**

In 2015, CORFO had total assets worth USD 6,272 million, which represent 2.6% of Chile's GDP. When analyzing their composition, we can note that in 2015, the

financial support deployed by CORFO (through grants, credits and guarantees, see Table I) amounted to USD 2,863 million, which represents only 1.2% of Chile’s GDP. This makes CORFO significantly smaller in scale than national development banks in other countries, such as KfW, CDB and BNDES.

**Table I**

<b>Financial Support (million USD)</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
Subsidies	194.54	181.89	194.68	199.61	304.96	332.94	332.17
Guarantees	1,219.59	2,277.88	2,541.56	3,414.83	2,729.42	2,360.37	2,457.36
Loans	508.34	192.97	166.41	104.08	80.13	61.07	74.35
<b>TOTAL</b>	<b>1,922.47</b>	<b>2,652.74</b>	<b>2,902.65</b>	<b>3,718.52</b>	<b>3,114.50</b>	<b>2,754.38</b>	<b>2,863.88</b>

\* million USD

As pointed out, CORFO’s main financial support to the private sector in recent years has not been through loans, which only amounted to USD 74 million in 2016, but through loan guarantees to financial institutions. By 2016, the guarantee stock level was USD 2,467 million. Indeed, in GDP terms, CORFO’s guarantees are among the highest granted by a public institution in Latin America. Given the importance of guarantees in CORFO’s current activities, we focus more on this instrument below.

It seems useful to point out here, that there is a perception among many observers and users of CORFO’s resources, that the institution has too many priority sectors and too many instruments. As one observer commented, ‘*for every problem, there is a separate instrument*’ (interview material). Reportedly, users also find procedures for application for resources in some programs unclear and cumbersome, sometimes even discouraging them from applying or requiring major transaction costs for such





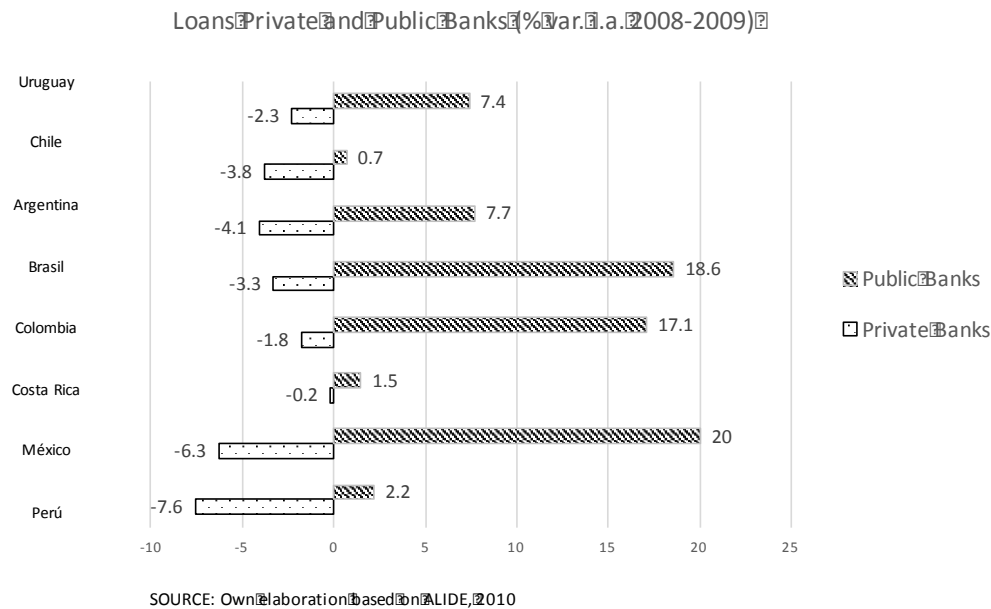
applications. There are exceptions, and users report that some programs -including guarantees- operate in a fairly agile way. Streamlining priority sectors and instruments, and working on the simplification and transparency of application procedures may be a valuable and high priority task to increase CORFO effectiveness.

## VI. CORFO's Countercyclical Role

The role that governments should play in the financial system has been much debated. Some authors had negative views about the role of public development banks as growth catalyzers, basing their critique on the risk of political favoritism and corruption, as well as efficient private financial markets arguments (La Porta, 2002; Sapienza, 2004). During the 1980s and 1990s, public banks were severely criticized by neo-classical economists, who argued that what they called 'financial repression' was inefficient. Thus, regions such as Latin America, where 65% of the banks were publicly owned during the 1970s, went through massive privatizations in the 1990s, and by mid 1990s only 40% remained state-owned (Micco & Bank, 2005). Nonetheless, in the aftermath of the 2008-2009 financial crisis, the previous trend was reversed in many emerging and developed economies (Culpeper, 2012). In European economies, national development banks were either expanded or even created, and the regional development bank, the European Investment Bank, was given a far greater role since the 2008/9 crisis as well (Griffith-Jones and Cozzi, 2016).

In many Latin American economies, public banks' operations surged due to the counter-cyclical lending they deployed after the crisis, while private banks' lending shrunk (Figure I). Empirical evidence has been collected by authors such as Bertay, Demirgüç-Kunt & Huizinga (2015:327), who studied more than 1,600 banks in both emerging and developed economies and found that '*...state banks can play a useful role in stabilizing credit over the business cycle as well as during periods of financial instability.*' Furthermore, Schclarek et al, in this volume, provide empirical evidence that shows how counter-cyclical public development banks have been.

Figure I



In the case of Chile, Banco del Estado, the public bank that lends directly to small businesses, increased its loans sharply, while private loans plummeted. Ribeiro de Mendonça, Ana Rosa & Sibin (2008) show how Banco del Estado increased its corporate loans by 32% in 2009, while others shrunk more than 7%. At the time, Banco del Estado also encouraged the construction sector by reducing mortgage interest rates. This was part of a more general anti-cyclical policy encouraged by the national government, which, in the wake of the international financial crisis, increased its fiscal expenditure by 15% in a clear counter-cyclical move.

Chile's previous adoption of the so-called Cyclically Adjusted Balance (CAB) rule, compels the government to follow spending targets that enable the deployment of general counter-cyclical fiscal policies, which is very positive. However, authors such as French-Davis (2010) argue that it was only during the 2008/9 global financial

crisis that the fiscal rule operated in a really counter-cyclical manner, whereas this should become the case generally. Instead, he regards the general Chilean rule as more ‘cyclically-neutral’ and not sufficiently counter-cyclical, though superior to the pro-cyclical nature of private finance, both domestically and internationally.

It is important to stress, in the context of this paper, that CORFO, whose funding sources are to an important extent provided by the Chilean Finance Ministry, also expanded its programs counter-cyclically. This is clearly evident when examining CORFO’s annual budgets, which almost doubled from 2008 to 2009. CORFO provided liquidity to the financial market by injecting an additional USD 850 million in 2008, intended to leverage USD 1,800 million. Out of this figure, most of the money was targeted to long-term investments (USD 500 million), but short-term lending was also supported. Ensuring solid payment chains across the different sectors is of the utmost importance in crisis settings. Thus, CORFO tendered USD 300 million to support working capital through the banking system and using factoring mechanisms that could target the usually unattended smaller firms.

Apart from providing liquidity to the financial system, CORFO also made most of its guarantee scheme’s requirements more flexible and increased its limits to expand its reach (ALIDE, 2009). Overall, between 2007 and 2011, Hermann (2014) shows that CORFO increased the guarantees for SMEs seven times. This partly reflected the shift of preference for the guarantee instrument, but also had an important counter-cyclical aim.



Along with the general countercyclical stimulus implemented by national governments in Latin America, national development banks had a crucial role supporting the economy, when private lending fell (ALIDE, 2009; Griffith-Jones et al in this volume). It is also important to notice that the counter-cyclical role of national development banks is complemented by the important counter-cyclical role that regional and multilateral development banks play; this was very clear in the case of CAF and IADB lending to Latin American countries, in the wake of the 2008/9 crisis.

## VII. Areas of Activity

In terms of areas of activity, CORFO has three focal areas: productive diversification, support to innovation and entrepreneurship and foreign and national investment promotion (CORFO, 2016).

### a. Structural Transformation and economic diversification

The Total Factor Productivity (TFP) growth rate in Chile dropped from an average of 2.4% in the 1990s to 0.5% in the 2000s, a situation that becomes even gloomier when considering Manufacturing TFP. In addition, the export sophistication index significantly decreased in the last years (Bitran, 2016). These figures illustrate that Chile needs to develop dynamic competitive advantages and achieve structural transformation, through greater and ‘smarter’ diversification. The need for such a strategy has received increased support in the last few years, especially from the Bachelet Government; the urgency of both increasing productivity and diversifying the Chilean economy was made clear by the sharp fall in copper prices and the apparent end of the ‘commodities super-cycle’.

CORFO is seen by the Chilean Government as a valuable policy instrument, which should play a key role in the coordination of private companies, channelizing appropriate finance for them and identifying market gaps, as well as opportunities. Furthermore, far higher priority than in the past is given to the task of diversifying the Chilean economy, and especially exports. In this context, in 2014 the Chilean government launched the ‘*Chile Transforms*’ program, which makes CORFO

responsible for 37 *'Strategic Schemes of Intelligent Specialization'* and grants support, including subsidies to 10 sectors, selected as engines for development: advanced manufacturing and mining, solar energy (see Green Policy section below), food, tourism, fishery and aquaculture, intelligent industries, construction, logistics and creative economy.

The main goal of this tool is to try to diversify Chile's productive structure, moving from an economy exclusively based on natural resources to one that is more complex, knowledge-intensive and competitive. For example, in 2013 CORFO launched a financial program called *'Engineering 2030'* to help diversify Chile's economy and scale up to a more knowledge-intensive economy. The scheme consists of subsidies to Chilean universities, which aspire to transform their educational program in engineering, focusing on key areas (health and sustainability) that could boost ~~trigger~~ international competitiveness across several productive sectors. (interview material). With the same developmental purpose, complementary subsidy lines are given to *'Strategic Nodes'*, which aim to promote engagement among entrepreneurs and SMEs, in order to foster collaboration in areas of mutual interest. The type of nodes covered are related to public and private coordination failures and include market information, quality control or the improvement of standards for suppliers; the project is presented by an intermediary consultant, who deploys the program. An important difficulty of using nodes is the risk of capture by consultants, which can be minimized by filtering demands by companies requiring these services. (interview material).

Also, initiatives such as PROFO (Programa de Proyectos Asociativos de Fomento), aim to enhance firms' associativity and grouping for common tasks to gain

competitiveness in both internal and external markets. This program was inspired by similar initiatives supporting clusters in Spain and Italy; its success is illustrated by the example of small winemakers, who used to sell to larger producers, but decided to team up and improve market access by constituting their own brand (Rivas, 2012). In a similar way, the PDP scheme (Programa de Desenvolvimento de Provedores) provides subsidies to stimulate local value chains and co-finance the development and improved quality of local providers. Overall, financial support to encourage competitiveness given through these different programs to 24,963 beneficiaries involved in 1,473 projects, amounted to USD 60.2 million in 2015.

#### b. Innovation and entrepreneurship

Leapfrogging into higher value-added activities in Chile entails taking full advantage of previous productive capabilities and enhancing them through the creation and diffusion of new technological opportunities. However, a reverse trend seems to have unfolded in Chile in the last decade, when the percentage of innovative firms plummeted from 37.9% in 2004 to 16.6% in 2014 and expenditure in R&D lagged behind many countries, at only 0.39% of GDP (Bitran, op. cit). To tackle this obstacle, and in consideration of the constraints that uncertain innovative projects and start-ups with no track record face, an important part of CORFO's programs rightly focus on this area, where externalities and high risk investment play such an important role.

According to a report by the Chilean Ministry of Economy, Chile is positioned among the top 20 entrepreneurship ecosystems in the world and first in Latin America,



creating more than 200 new dynamic firms per year (Ministry of Economy, 2015).

The main CORFO programs to support entrepreneurs are *'Seed Capital'*, which had applications from over 5,200 firms and granted over USD 4 million to 118 of them in 2015; *'Start-Up Chile'*, further detailed below, and the *'Scheme for Regional Entrepreneurship and Innovation'*, with more than 250 applicants and over USD 2,5 million granted to 80 projects. The budget for financial support to innovation exceeded USD 60 million in 2015, which entailed a 98% increase compared to the average in 2010-2013. These programs include interesting instruments, such as tax exemptions for R&D given to private companies. A significant 80% of the 680 approved projects were from SMEs. Also, CORFO stimulated the creation of technology centers and technology transfer programs, which received support for over USD 33 million in 2015. The above-mentioned schemes, in large part, provide funds given as subsidies, granted through public tenders. Subsidies disbursed by CORFO in 2016 totaled over USD 330 million (Table I).

Part of the explanation given for a structure of instruments that gives priority to guarantees and grants, is that, overall, there is plenty of funding available in Chilean private markets for established companies, allegedly for relatively long maturities at relatively low costs. Loans by CORFO to commercial banks for on-lending are apparently seen as less necessary than in other Latin American countries. This seems, however, not to be the case for innovative enterprises and start-ups, due to uncertainty, a situation typical for new activities and enterprises, which often do not have tangible guarantees; nor is it clear that long maturity loans are available for SME projects.

The fact that such high priority is given to sectorial diversification, which implies going into new sectors where uncertainty and externalities are higher, as well as to the need for Chilean companies to invest abroad in new sectors, implies private banks and capital markets may not be up to the task on their own, especially for providing long-term finance to new sectors, as well as to new enterprises, and start-ups.

Acknowledging this funding gap, CORFO, since 1999, has been providing long-term resources to expand the role of Risk Capital Funds, which aim to support innovative firms, both during their early and growth stages. Up to 2016, the historical investments amounted to USD 630 million, provided to 43 funds and 194 beneficiaries, which in their vast majority were SMEs, in the Information, Technology and Communications (ICT) sector (interview material).

Furthermore, there are gaps in Chilean non-banking financial intermediaries, such as for cooperative financial institutions, leasing and factoring companies; CORFO is developing initiatives to support the development of these institutions. Often the issue with the funding that these institutions are able to provide relates not so much to the amounts granted, but to the conditions (of cost and especially maturity). Furthermore, these financial institutions need both financial support and technical assistance, which CORFO is providing with its new initiative, funded by KfW. Also, the banking system is fairly concentrated in Chile, which can lead to excessive spreads on borrowing, and very high return on equity of banks (interview material). CORFO and other institutions are designing measures to deal with these market gaps and imperfections.

c. Foreign and National Investment Promotion

CORFO works in cooperation with Chile's Foreign Investment Committee to attract foreign capital to the Chilean market. Also, CORFO encourages local investments by granting loan guarantees, financing Reciprocal Guarantee Institutions (IGR) and operating through financial institutions.

The guarantee mechanism consists of ten different programs. The main three are FOGAIN, by far the largest scheme, which represented 93% of CORFO's guarantee transactions in 2016, and covers long-term investments and working capital; the other interesting programs are COBEX, which covers export operations and PROINVESTMENT, a new program that represents only 3% of the guarantee portfolio and encourages the long-term investments of larger firms. In addition, CORFO also provides financial support to Chilean Institutions of Mutual Guarantee, namely IGRs.

The IGR system was born in Europe and diffused in some Latin American countries since the 1990s. In Chile, the IGR fund was established in 2007 and its norms have been designed by CORFO, which can leverage private investments up to ten times. However, its size has always been modest, covering only 2% of the guarantees issues between 2010 and 2016.

CORFO's main area of intervention is now guarantees. However, this focus has only been stressed since March 2010, when FOGAIN and IGR systems were reformulated by CORFO. At their origin, public guarantees were mainly issued by FOGAPE

(Fondo de Garantía para el Pequeño Empresario), a government fund launched in 1982. Until 2011, FOGAPE was still the main protagonist in the public guarantee landscape, far ahead of the IGR system and CORFO. For instance, in 2010 the number of its transactions reached 76,171, while IGR and CORFO only recorded 1,522 and 4,484 transactions respectively. However, by 2013, FOGAPE's activities had dropped by 36% while CORFO's surged by almost 2,000%, to more than 93,000 guarantees. It is noticeable, though, that apart from taking the lead in the guarantee system, CORFO's intervention also enabled a general increase of support to a wider range of beneficiaries. This is because, unlike FOGAPE, which only supported small and micro enterprises, CORFO reached medium-sized firms (Hermann, 2014).

It is also noteworthy that, at the same time, in 2011, the credit lines managed by CORFO fell sharply, dropping 62% in only one year. In the period between 2010 and 2014, the value of loans fell even more dramatically by 84%, with some fairly minor recovery in 2016 (Table 1). In 2011 and in the following years, many medium and long-term credit lines for SMEs ceased to exist, which partly explains the sharp fall in the level of loans (interview material). This structural shift in CORFO, away from the loans that were granted during President Piñera's government, is attributed by some observers to the belief that public financial institutions should not crowd out private banking but, instead, cover the private banking sector's risks, by guaranteeing its loans.

## VIII. CORFO programs relevant today

### a. Impact of guarantee programs

An interesting question is why CORFO has used guarantees far more than credits in recent years, a trend that became particularly marked during President Piñera's 2010-2014 government, even if it continued in later years. Though guarantees are clearly a valuable instrument, especially for providing access to companies without sufficient physical assets to offer as collateral (e.g. those who have mainly intangible assets, like an innovative idea), and they allow for additional leverage of CORFO's capital, guarantees often need to be complemented by other instruments, such as credits and subsidies.

The emphasis on guarantees seems based on the idea that banking and capital markets are well developed in Chile, which is true. However, this line would also argue that guarantees are sufficient to encourage additional private finance to previously excluded SMEs and that credit granted by institutions like CORFO may 'crowd out' private finance. This is certainly not true for financing in sectors where there is much uncertainty, where economic, social and environmental externalities are not privately internalized and where there is a need for patient capital (e.g. new strategic sectors that demand high initial investments, innovative companies, etc.) and in sectors or activities in which private finance is unwilling to take the risks, especially on its own. Furthermore, the problem with guarantees is that, although profits from the loans will go to the private financiers, the risks or at least those portions covered by the guarantees, will be assumed by the public sector. This asymmetry may be

problematic, as it may result in large contingent liabilities for CORFO. In this sense, it is important that enough provisions are made up front; CORFO seems to have been prudent in this aspect by restricting the scale of its leverage well below the limits established in its regulations. It is a source of some concern that CORFO's guarantee programs, which have been scaled up so much, have only partly been evaluated; however, as discussed immediately below, the evaluation of FOGAIN, which represents the largest guarantee mechanism, has shown positive results, especially in terms of broadening financial inclusion.

Indeed, the FOGAIN scheme was evaluated in 2013 through qualitative interviews, in which 84% respondents declared to have experienced a positive impact from using the scheme, 40% in terms of productivity, 16% in terms of increased sales, 13% of profit and 5% of employees. Furthermore, the scheme enabled the financial inclusion of previously excluded companies, which amounted to 15% of the total.

The impact of guarantee granting is allegedly large, as the funds are allowed to extend collateral for up to eight times its value, implying high leverage. The lack of adequate collateral is one of the most severe limitations to financing long-term projects in Chile. In many cases, traditional banks demand real assets that duplicate the value of the loan, to cover any potential unpaid interests or associated expenses. Thus, many firms, especially SMEs, that intend to pursue investments to increase their productive capabilities or efficiency, cannot access such funding, unless it is provided with guarantees, an area where CORFO plays a key role. Though the guarantee instruments have been successful in helping leverage additional credit, they have reportedly been less successful in lowering its cost (interview material).

## b. Start-Up Chile

The main aim of the National Innovation Policy, designed by the Innovation Department of the Ministry of Economy, is the promotion of entrepreneurship and innovation to achieve the objectives of the productive development strategy. The plan granted great importance to the establishment of an ‘innovation and entrepreneurship ecosystem’, creating the Start-up program, a competition for global entrepreneurs that offers rewards to entrepreneurial initiatives with high potential in Chile.

Participants in the program have to develop their projects with minimal financial resources (bootstrap) within a six-month deadline. The grants reached up to USD 40,000 USD for Seed Capital and a one-year work visa. The pilot plan, carried out by Innova Chile with 22 start-up projects, was successfully completed during the testing phase. The program was then officially implemented.

Since mid-2011, more than 10 generations, with around a hundred projects, have gone through *Start-Up*. Over the years, modifications have been made to the benefits and requirements. Currently, *Start-Up* offers 90% of total program cost funding, with a maximum of USD 40,000 USD per project. Beneficiaries should contribute 10% of the expenses. There is an additional prize of USD 20,000 for carrying out the projects in regions outside the capital and for Chilean repatriated students with postgraduate degrees obtained in the best 150 universities around the world. Finally, successfully completed projects can apply for a second stage of funding, which can reach up to USD 120,000.

Within the institutional framework of the national system of innovation, the impact evaluation of the instruments and programs is a key element. In 2015, the Ministry of Economy hired an outside consultant to evaluate *Start-Up*. The main objective was to evaluate specific results from the program, as well as assessing the aggregate impact on the economy.

For the evaluation, four objectives of the program were identified: i) world class entrepreneurs develop companies with global potential in Chile (attraction/retention), ii) local entrepreneurs develop knowledge, skills and networks, iii) other participants in the Chilean entrepreneur ecosystem improve their access to information and become more entrepreneurial and open to innovate, and iv) the international community improves its perception of the Chilean innovation and entrepreneurship ecosystem. (Verde, 2016)

The first nine generations of beneficiaries, involving 785 projects, were evaluated. The methodology included surveys of project leaders and interviews of participants from the national entrepreneurship ecosystem, considering intermediate and final variables. Results showed that the program had a positive impact on raising capital and the amount of capital raised. However, the program did not have a statistically meaningful impact for the projects in term of: continuity of the start-up, sales (total value and growth), profits, exports, level of employment, later support from business incubators and accelerators, and number of subsequent entrepreneurial ventures launched by the project leader.



Finally, the evaluation makes a series of suggestions, including defining as the main purpose that world-level entrepreneurs have to develop start-ups with high global potential in Chile (a recommendation that has started to be implemented), as well as prioritizing criteria related to the entrepreneurship potential and its permanence in the country, and the incorporation of specialization alternatives for the program, by market or technology.

The evaluation carried out by Verde clearly has value regarding the understanding of the impact of Start-Up on the economy. However, while having evaluation reports is key to test the effectiveness of instruments, the results have to be interpreted within the context of the limitations of the methodology used, in order to determine the value of the evaluation and its limits.

The high reputation of the *Start-Up Chile* project is evident and acknowledged in the national and international press as well as publications by important international organizations, such as the OECD Development Center (OECD, 2016), which concluded that Start-Up programs reveal a different, more dynamic side to the Latin American region, and to Chile, specifically. According to OECD (2016), '*Start-Up Chile media impact has helped make Chile a talking point around the world and inspired young people to become entrepreneurs*'. Besides, *Start-Up Chile* has been an example for the creation of similar initiatives aimed at establishing favorable environments for startups in other countries of the region ([www.startupchile.org](http://www.startupchile.org)). Engineering projects, 3D educational projects, applications to facilitate communication with suppliers, and others that offer digital books to children

represent the range of entrepreneurship projects that have successfully gone through the program.

At the end of 2015, the family of start-ups in Chile included 1 unicorn (start-up of at least USD 1 billion), 4 centaurs (with a valuation between USD 100 million and USD 1 billion), and 31 little ponies (with a valuation between USD 10 and USD 100 million). This is one of the most positive situations in the Latin American region, and is even comparable in scale to Singapore, one of the vanguard countries in terms of entrepreneurship, which has generated 2 unicorns, 12 centaurs and 27 little ponies (OECD, op.cit).

General perceptions of Start-Up within the Chilean innovation ecosystem are positive, particularly due to the way the program is conceived, with identification and project selection, and the resulting international positioning of Chile within the start-up field (Rivas, 2012). Assessing the overall impact of the program from a broader economic point of view (value generation, quality employment, productive diversification and sophistication) is complex, but there have been positive individual results from the projects, and perceptions of the program show a favorable picture regarding its impact in Chile. Specific problems, such as excessive concentration in the capital city, are seemingly being corrected, with special emphasis on encouraging start-ups in different regions.

One of the benefits of the CORFO Start-Up program, which has its own dedicated Division in CORFO, is that it has encouraged the modernization, improvement and broadening of the policy mix to support these companies in Chile. For example,



relevant regulations have been simplified, with a new law that allows people to start a new business in a single day. Furthermore, available financing has been expanded to support different phases of the projects. CORFO, the rest of the government, the private sector and universities seem to be collaborating effectively to support the creation of start-ups, which will hopefully contribute to the greater technological sophistication and diversification of the Chilean economy.

## IX. Green industrial policy: the case of solar power in Chile

Designing an effective strategy for development is still a matter for debate. Many mainstream scholars allege that the state should not build capabilities and steer resources to specific sectors because they tend to ‘pick losers’, thus creating inefficiencies. More heterodox economists, such as Chang (2002), show that now developed countries, which had applied highly interventionist policies to promote a leap in their development, are now ‘kicking away the ladder’ to prevent emerging countries from climbing a few rungs. Some authors may claim that boosting a global green growth strategy to reduce carbon emissions could hamper developing countries’ abilities to follow the Global North countries’ growth path. However, there is growing consensus that green growth could act as a job-creating, inclusive, developmental strategy, if correctly encouraged.

According to Carlota Perez (in Mazzucato & Jacobs, 2016), the next techno-economic paradigm could take a green direction, due to the innovative potential, ability to transform linked industries and to renovate societal consumption habits of green projects. Thus, developing countries seeking to take advantage of this new ‘window of opportunity’ in development (Perez, 2010), should build capabilities around these technologies. Latin American countries, such as Chile, highly endowed with natural resources, could use them as a platform for development. Renewable Energy Technologies (RET), such as solar energy, on which we focus, have the potential to catalyze inclusive growth and sustainable development for various reasons.

Firstly, in Chile, diversifying the energy matrix through the incorporation of Renewable Energy Sources (RES) was necessary to gain more self-sufficiency and stability in energy provision. In the 1990s, Chile's energy generation was based on large hydroelectric projects, insufficient when demand increased and droughts turned more frequent. The country imported gas from Argentina and invested in combined-cycle power stations. However, since the mid-2000s, Argentina stopped providing gas at a convenient price and Chile suffered provision shortages (Nasirov & Silva, 2014). In 2008, Chile, seeking to diversify its energy matrix, launched its Renewable Energy Policy (NCRE). The law established a 10% renewable energy target for 2024. However, the NCRE policy proved so successful that, by 2012, Chile had already met a 7% target. In 2013, a new target of 20% was set for 2025. Stabilizing the energy supply by developing RES has had a huge impact on individual and industrial consumers, who could access energy without interruptions and at lower price. The incorporation of NCREs to Chile's last electricity tender, in 2015, reduced the price by 40%, from USD 47 MWh to USD 29 MWh.

Secondly, a mission-oriented policy to develop the solar power industry (for which Chile has great comparative natural advantages) is helping catalyze sustainable and inclusive growth. It incentivizes local producers to develop innovative business models that introduce new technologies and use local natural resources. It fosters dynamic comparative advantages that could position Chile as an internationally competitive producer. Besides this potential for exporting renewables to neighboring countries, there is also the possibility of exporting industrial products produced with renewable energy, which can reach new market niches and secure higher prices.

Currently, only 17% of the solar energy firms are local, but the target for 2050 is to reach 55% of the market (Fundacion Chile, 2015). In addition to the limitations that local players encounter as they seek to compete with foreign solar power firms, they also find it difficult to take advantage of the upstream and downstream positive externalities that this new industry creates. Foreign firms have high quality standards, which are not always met by local players. In the case of Chile, most solar firms' suppliers are from China and Europe. Thus, the scope to add local value in the solar energy value chain is reduced. Nonetheless, Fundación Chile's report (2015) shows that Chilean companies have a potential niche, as providers of solar power plants' related services, such as the provision of software products to measure and control energy supply or engineering services. The study estimates that more than 45,000 new jobs could be created in Chile.

Thirdly, providing solar energy contributes to reducing inequality and social exclusion, by giving access to electricity to off-grid remote rural areas, based on a cost-effective new business model. One essential aspect for this to work is to grant financial facilities to rural households to acquire the panels and pay for the energy. Digital finance solutions, such as Pay As You Go platforms to pay for solar energy consumption have become increasingly popular in African and Asian countries, but they need to be developed in Latin America. In Chile, more than 3,500 rural communities are still excluded from the interconnected power system (Letter, June, & Erlick, 2015) and could take advantage of Pay As You Go systems. This figures in the 'Energy 2050' policy, which proposes energy access to 100% of Chile's vulnerable households by 2050. Furthermore, the Ministry of Energy encourages the use of solar panels on the rooftops of every household, small and medium businesses and public

buildings. This initiative targets energy self-sufficiency for regulated clients, who can also provide their surplus energy to the grid (Relac, 2016b).

The impact of using technology innovations to grant access to decentralized energy solutions is immediate. It bolsters job creation as it enables business to grow by giving them more time to operate and improves education conditions by giving children more time to study. This could bring new opportunities to achieve transformational social change and development outcomes in developing countries.

According to Ban Ki-Moon, former Secretary General of the United Nations, USD 48 billion per year need to be invested to reach universal energy access by 2030 (Ban Ki-moon & Nations, 2011).

A final reason to deploy a green growth strategy is for environmental reasons. In 2015, Chile committed to the Paris Agreement and its global goal of mitigating climate change by reducing fossil-fuel energy sources and carbon emissions.

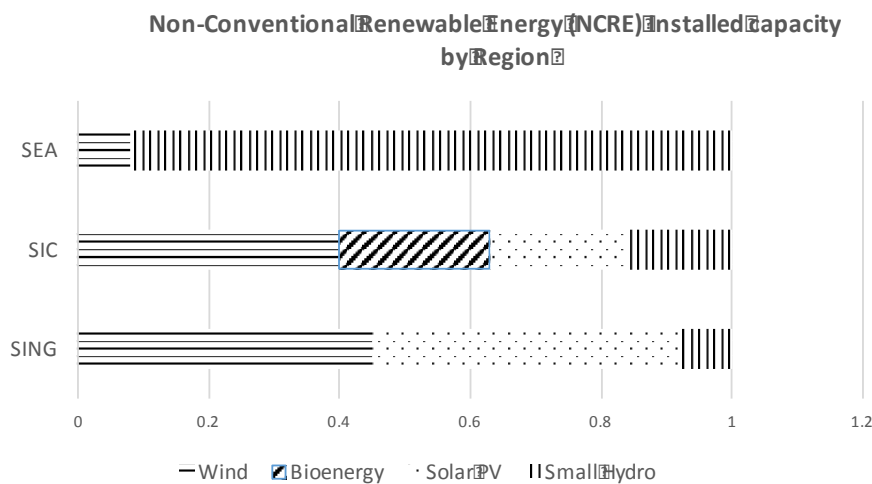
According to the NRDC Issue Brief (2013), targeting the 20% would reduce CO<sub>2</sub> emissions by 83 million tons. In addition, if hydro projects are replaced by NCRE, savings in water consumption will represent 11%, significant when considering Chile's lack of access to water.

Currently, Chile is among the highest energy consumers in Latin America, with 3,568 kWh per capita, but it produces less than 35% of what it consumes. Thus, encouraging diversification of energy sources is crucial for a long-term development strategy. The government's decision to set a green policy direction was initially reflected in the National Energy Strategy 2012-2030, documented by Chile's Ministry of Energy

(Agostini, Nasirov, & Silva, 2015). Later, the current government launched a new energy policy, called 'Energy 2050', which established a 70% threshold of NCRE to be reached by 2050.

Within non-conventional sources, the generation distribution is even between wind, with 28% of the market, small hydro 23%, bioenergy 23% and solar 21% (Center for Innovation and Development of Sustainable Energy (CIFES), 2015). Installed capacity for electricity generation based on renewables is also evenly distributed, but varies substantially by region (see Figure II). However, solar power in Chile is regarded as one of the sources with the largest estimated potential. The Atacama Desert, in north Chile, has the world's most powerful solar radiation. The location of these photovoltaic (PV) panels is strategic, because they feed energy into the Northern Interconnected Power System, SING, used by mining companies, which are the largest energy consumers in Chile (Griffith-Jones et al, 2017).

**Figure II**



SOURCE: Own elaboration based on CIFES, 2015



However, both financial and non-financial barriers impede the deployment of renewables at full capacity in Chile. As Nasirov et al. (2015) show, many renewable energy projects approved by Chile's Environmental Evaluation Service have not gone to market yet. In 2015, only 52 projects with capacity to generate power for 2,338 MW were under construction, while approvals reached a power generation capacity of 17,543 MW (Center for Innovation and Development of Sustainable Energy (CIFES), 2015). While many limitations may be involved in preventing these projects deployment, this section will mainly focus on the financial constraints.

Nonetheless, many non-financial factors are also at play. For instance, price instability, contract negotiations, path dependence, infrastructure conditions related to the poor grid connection between the Northern Interconnected Power System (SING) and the Southern Interconnected Power System (SIC) are also factors. All these issues impose constraints on the supply side. However, policy makers should also focus on the demand side, which may frustrate promising projects from taking place if, for instance, local communities oppose PV solar projects because they occupy vast land portions. This has been raised by '*Energy 2050*', which introduced a requirement for community-firm 'associativism' in every green energy project. Greater efforts to involve local representatives are needed to prevent opposition. (Moguillansky, 2016). In this regard, Germany's '*Energiewende*' ('Energy Turnaround') green policy is well known for its capacity to involve the local community in the construction process, providing them with clear information on the benefits of green energy (Zoellner, Schweizer-Ries, & Wemheuer, 2008). In fact, many of the actions taken by KfW, Germany's National Development Bank, went far beyond funding green energy producers; they also targeted consumers by helping to promote the green economy

and funding (and even subsidizing) households to increase their energy efficiency.

Considering both sides of the green economy when designing and implementing renewable energy policy seems key.

However, one of the main barriers to the deployment of renewable energy projects is financial. Long-term innovative projects have limited access to traditional financial sources due to their particular characteristics. Their future cash flows are uncertain, their projects' payback periods lengthy and their technical specificities difficult for credit rating evaluators to assess and monitor. Finally, positive externalities from green growth projects, such as carbon emission reduction or job creation, are not internalized by private investors. States conducting mission-oriented policies that intend to shape the market in a 'green direction', ought to support NRCE projects with long-term, patient, public funding (Culpeper, 2012). In particular, Chile's solar projects have a payback period of 8 or 9 years on average (Moguillansky, 2016) and the private financial sector is not familiar with potential risks. Moreover, local bankers have limited experience with Project Finance structures, the mechanism through which these projects are usually funded (Nasirov et al., 2015). Local companies that intend to enter the solar industry often have no track record or real collateral. On the contrary, the players in the electricity market that can use contracts as collateral are the traditional providers, frequently reluctant to diversify into green energy.

Traditional electricity generation firms in Chile did not show an interest in the new market, but they are gradually being compelled to diversify their services into new venues such as desalination, due to the sudden increase of players in the electricity

market and its plummeting price. However, they are still protected by national regulation, which ensures a 30% technical minimum for traditional companies with large variable costs. This norm, in fact, prevents solar power companies located in the North from injecting electricity into the Northern Interconnected System.

As a consequence of this lack of market for renewables, many solar firms located in the Atacama Desert are facing severe restrictions from both local and foreign financial institutions, which have become more risk-averse and increased their requirements for NCRE projects. In this regard, representatives of private banks in Chile, have declared their concerns about new actors entering the market without proper expertise, and they have made it difficult for them to borrow (Relac, 2016a; Relac, 2017). This additional restriction poses a serious danger for the achievement of the renewable energy production target, set by Acera. According to Acera, the Chilean Association for Renewable Energy, 2017 could deliver investments for USD 2,300, estimated based on 1,500 additional MW of installed capacity, at USD 1,5 million per MW. However, it is worth noting that reaching this challenging target, which would reflect a 40% MW rise, would necessarily entail a steep increase in the available public financial mechanisms for the sector.

CORFO designed special financial mechanisms to provide a solution to the aforementioned concerns. As part of the productivity agenda, carried out by the National Government and the Ministry of Economy, in 2014, CORFO designed a National Strategic Solar Industry program, within the Strategic Program of Intelligent Specialization and the '*Transforma*' initiative. As part of this program, CORFO designed specific credit lines, whose funds are offered through public tenders.

The main financial support program that CORFO has launched is a scheme to co-finance up to 70% of solar PV projects, the PV Solar Energy for Desert Weather and High Radiation, to encourage adaptation of the solar energy industry to the local environment... Its main goal is to nudge developers' adaptation to local conditions (for example, very high heat in the sun) and diminish the energy price. Among the requirements, CORFO demands that beneficiaries innovate, associate with technology centers and strengthen local value-added and exports. Also, public funding will be provided to incentivize self-sufficient solar models, quality certification and R&D.

Finally, CORFO has designed a credit line to support and help create value for local suppliers to develop prototypes, scale them and take them to market. Considering the government has detected a niche in service and product provision to the solar industry, this program could catalyze local sustainable growth throughout the value chain. However, even if many of these programs are promising, they are relatively underfunded by the Ministry of Economy. As with many other programs, the target is not always clear and the bureaucratic procedures reportedly deter firms from applying (Moguillansky, op. cit).

## X. Conclusions

Since 1939, the year it was created, until today, CORFO has played very varied roles, being seen overall by governments of different persuasions as an efficient instrument to serve their development objectives and strategies.

Unlike many developing countries' national development banks, and despite a high level of non-performing loans in the late 1980s, CORFO proved resilient to policy recommendations that advocated for its dismantling, with a highly positive outcome in the Chilean case (Rivas, 2012). The prevailing position argued that CORFO was essential to tackle market failures that could hamper SMEs' development potential, as well as to support greater innovation and diversification.

Over the years, CORFO's instruments evolved and it stopped granting direct loans, to continue as a second-tier bank, on-lending through financial intermediaries. Later, it shifted further from granting credit through financial intermediaries to focusing more on guarantees for credit (through financial intermediaries) and on subsidies.

Currently, it concentrates mainly on innovation and entrepreneurship, by granting subsidies through public tenders as well as guarantees. CORFO has emphasized strategic collaboration with the private sector. Furthermore, it has given importance to a careful evaluation of the impact of many of its activities, which is a positive feature.

In recent years, CORFO has been very innovative in several of its instruments.

Above, we have discussed in some depth the *Start-Up Chile* program, which has received international recognition and been emulated by other Latin American countries; there is however, room for improvement, for example by increasing its

impact on variables, such as employment and sales, as well as decentralizing its activities more to the provinces. We have also detailed in depth the support that CORFO instruments have granted, in specific sectors, illustrating it with the case of solar energy development, which, combined with a very favorable policy framework, has positively contributed to the highly successful growth of solar energy. It is noteworthy that private financial mechanisms played a significant role in financing solar energy in Chile. However, the Chilean case clearly shows that private funds will discontinue their support towards RES projects as soon as price volatility scenarios or other risks emerge. Private financial institutions are not capable, nor willing, to take the risks that green growth investment demand. Thus, relying only on their funding could jeopardize the green economy national strategy, if not supported by public financing. The role of CORFO is essential to provide stable funding to producers capable of adapting to special local conditions and fostering local value added, as CORFO does through its credit line encouraging PV Solar Energy for Desert Weather and High Radiation.

More broadly, with the *'Chile Transforms'* program, launched in 2014, the government decided to enhance CORFO's goals by selecting strategic sectors with the potential to create dynamic competitive advantages, foster innovation, support structural transformation and increase productivity. This seems very valuable, and CORFO has undertaken the task with great enthusiasm; this is especially crucial, at a time when the urgency of undertaking structural diversification was increased by the sharp fall in the price of Chile's main exports, and particularly that of copper. Though many valuable steps have already been taken by CORFO, and by the government more broadly, and great efforts are being made to increase coordination with the

private sector, it would seem desirable to improve the coordination between government agencies, including CORFO, to better focalize resources and efforts, as well as improve collaboration with the private sector on both sides.

It is noteworthy that an important part of the funding provided is non-reimbursable, instead of loans. Furthermore, as pointed out, guarantees play a large and growing role. Thus, as discussed above, CORFO's main instrument is not its loan granting, but its loan guarantees, which indirectly enabled loans for over USD 2,000 million in 2016. There seems to be a strong case for revisiting this approach, as credit instruments may be valuable and necessary for the task of major diversification, as the experience of KfW and renewable energy seems to demonstrate, for example (Griffith-Jones, 2016, Moselen et al, in this book).

A further, very important, issue to consider is whether CORFO's capital and operations are sufficiently large in scale given the magnitude of the existing challenges, even though the institution has grown in recent years, and overall CORFO is a very effective and efficient institution.

As pointed out above, CORFO's activity is much smaller than some of the other national development banks, in proportion to the size of the economy and to the total size of credit to the private sector... A larger scale may be needed, particularly given the growing consensus that productive diversification and innovation are necessary for Chile to achieve more dynamic, sustainable and inclusive growth, as well as higher productivity increases. In this case, mission-oriented finance on a sufficiently large scale may be especially valuable. It would be feasible to increase CORFO's

scale with a small contribution from fiscal resources, as CORFO can raise funding at low cost on international capital markets, given Chile's fairly high credit rating, and especially, given the depth of Chilean capital markets, also find funds at fairly low cost and long maturities on domestic capital markets. This would allow greater leverage for fiscal resources.

Furthermore, CORFO, in coordination with other parts of the Chilean government, and in dialogue with the private sector, has already clearly defined important sectors and activities that need support to achieve structural transformation. CORFO is carrying out a number of programs, many of them innovative, which have a very positive impact on the Chilean economy. Furthermore, CORFO is broadly seen as an efficient institution. It also has good teams, which can help design a more detailed industrial strategy, in close collaboration with the private sector. However, it lacks sufficient scale to deliver significant impact. It is therefore clearly necessary for CORFO to reach an appropriate scale to have a sufficient effect on helping fund the major structural transformation needed; the proposed mechanism, raising funds in capital markets, seems to offer a tested and effective way of doing so. It could also help deepen and further develop Chilean capital markets, and possibly encourage the use of new financial instruments, with CORFO playing the role of 'market maker'. Finally, like many national development banks, CORFO has a vast range of programs. Though most of them seem very effective (which is verified by evaluations regularly carried out), the question can be asked if it may not be more efficient to streamline them somewhat, to allow greater focus. Better information and transparency on application procedures (and CORFO's operations), as well as a simplification of these procedures also seems important for users. Finally, another question to ask would be





whether CORFO programs should be made more flexible, to respond even better to companies' needs that are not already met by the private financial sector.

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### List of people interviewed and who provided information

Carlos Álvarez  
Sergio Bitar  
Eduardo Bitran  
Claudia Bobadilla  
Fernando Carmona  
Mario Castillo  
Álvaro Díaz  
Mauricio Escobar  
Patricio Feres  
Joao Ferraz  
Ricardo Ffrench-Davis  
Jorge Katz  
Christian Larrain  
Claudio Maggi  
Oscar Munoz  
Edison Marchant  
Inti Núñez  
Luis Felipe Oliva  
Joseph Ramos  
Daniel Titelman